University of Hawaii at Manoa Library System

Office Automation Requirements Assessment

Prepared by: Todd H. Ogasawara

June 1986

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1. Purpose of the report

This report is an assessment of Office Automation (**OA**) needs and a description of the recommended system that meets those needs for the University of Hawaii at Manoa Libraries (UHML).

Most of the approximately 160 UHML Full Time Employees (FTE) currently perform all tasks using traditional manual techniques. Most of the tasks performed by UHML staff would be more efficiently done if microcomputer systems were integrated into work routines. Some of the tasks that would benefit from the use of microcomputers are report and memo preparation, correspondence, internal electronic communication, record keeping and analysis of staff status, preparation of signs and posters, budget analysis, serials cancellation analysis, reference desk transactions record keeping and analysis, and procedural decision aid. This report identifies tools to assist UHML staff is performing these functions.

2. Overview of the proposed system

UHML OA requirements were determined by meeting with staff members of various UHML work units. A list of identified needs were presented to the staff at these meetings. They were then given an opportunity to identify tasks not included in the current list. The system described in this report is a reflection of the perceived needs of the staff and the assessment of the Information Analyst tempered by current technological limitations and realistic fiscal constraints. This section provides a brief overview of the detailed recommendations and comments that follow.

2.1. System component selection factors

- **Functionality**
  Does the product excel as a functional tool?. Is it able to pass data to another program?
- **Reliability**
  Do the recommended products have a track record of reliable performance?
- **Current support based on market penetration**
  Is local support available for user training, custom programming, hardware set up, maintenance, and support of the product by other vendors (e.g., spreadsheet auditors)?
- **Future support based on current market penetration**
  What is the expected life of the product, expected support of the product by other vendors in terms of integration and add on products, and expected availability of supporting consultants in the future?
- **Cost**
  Is the cost of the product reasonable given budget constraints and the performance value of the product. The prices of microcomputer hardware

and software constantly changes. So far these price changes have been in the downward direction due to increased demand, vendor competition, and the progress in techniques to manufacture products more efficiently. The "list price" of a product is often much higher than the "street price" that the product can actually be purchased for. A reasonable budget constraint is assumed throughout the report in making product recommendations.

2.2. User considerations

If the recommended system is to be used by and useful to UHML staff members, the following must be considered:

- o The microcomputer system must be easily accessible to the users. The systems should not be placed together in a central location. The workstations should be on the desk of the users or nearby if the units are shared.
- o Adequate instruction in the use of applications software and hardware must be provided
- o Adequate on site consultation must be provided
- o Custom programming services must be provided to build unique and necessary tools.
- o Ergonomic factors must be considered. It is recognized that an optimal environment is difficult to provide for. However, it is in the interest of UHML to provide desks, chairs, lights, glare filters, etc. that insures the well being of UHML staff and thereby avoid unnecessary loss of work time and productivity.
- o Physical and information security must be determined and communicated to users

2.3. Applications

The following application needs were identified:

- o Word processing
- o Spreadsheet analysis
- o Data base management
- o Electronic communications (internal & external)
- o Project and schedule management
- o Form design and generation
- o Graphics
- o Expert Systems
- o Utility programs to enhance system usability

2.4. Microcomputer Selection

The International Business Machines (IBM) Personal Computer (PC) family of microcomputers have become the standard system of choice for OA needs. While other microcomputer manufacturers have systems that provide more raw computing power or other desirable features the IBM PC series has the widest and best set of available applications software and add-on hardware. Moreover, the IBM PC and IBM PC workalike computers have the greatest amount of support in terms of available instructors and custom programmers.

The first generation of IBM microcomputers, the 8088 based IBM PC, is now reaching the end of its market life cycle. Much of the available software is perceived to run slowly or sluggishly on this first generation system. This is due to the low throughput of the 8088 CPU caused by its low clock rate (4.77 MHz) and the low bandwidth of transferring data from memory to CPU (although the 8088 works on 16 bits of information, data is transferred 8 bits at a time from RAM to the CPU). In addition, the hard disk systems commonly used with the first generation PCs are usually slow (85 msec average access time). The large size of the applications programs and the data these programs deal with tend to reinforce the appearance of slow PC operation in the users' minds. This appearance of sluggish performance in the PC will be aggravated as available software becomes more complex and computationally intensive. This increased complexity is already being seen in software of all kinds including OA software. The microcomputers that emulate the IBM Advanced Technology (AT) 80286 based microcomputer allow for faster program execution due to a faster clock rate (the IBM AT CPU runs at 6 MHz; most of the suggested units here all run at 8 MHz), a true 16 bit data width, and faster hard disk drives (35 msec average access time). Although it is commonly thought that this level of microcomputer capability is only desirable for those involved in such obvious computationally intensive tasks as statistics, Computer Aided Design, and the like, this level of microcomputer capability should be considered the computer of choice for OA tasks because response speed is all important in tasks such as word processing, spreadsheet analysis, and data base management. A system that responds quickly to the user's demand will be used more efficiently and frequently. Slow machines tend to be frustrating for the user because it is perceived as being less efficient than doing the same task manually (even if the perception may not be true).

The processing speed of the microcomputer is not the only factor that affects users' perception of the usefulness of the machine. The ease of accessing and manipulating data on the system is critical to whether or not the system is perceived as useful. Three factors are of concern here.

- o There must be sufficient storage capacity for all the users' application programs and data
- o The speed with which files are accessed must be as fast as possible
- o Files on remote microcomputers must be easily accessible if useful information is to be easily shared among UHML staff

It is clear that access to large fast hard disks on a Local Area Network (LAN) is required to meet these three requirements. A LAN is a combination of hardware and software which allows many microcomputers to be connected together. This allows users to easily share information and peripherals such as large fast hard disks.

2.5. Functional organization

The LAN should be designed to maximize usefulness to staff members working on common problems and minimize problems due to network down time. The best network organization is based upon the concept of "cluster of working clusters." A working cluster can be based upon either geographic location (e.g.,

Cluster 1 could be the southern side of the first floor of Hamilton Library) as well as the functional personnel organization within UHML. Each working cluster is connected to other clusters, and therefore every other microcomputer, by bridges between the working clusters.

3. **Suggested method of acquisition**

The minimum optimum ratio of staff to microcomputers is 1:2. It is suggested that this ratio be achieved in three phases over a period of three years. It is recommended that the microcomputer systems be purchased in the following phases.

Phase	No. of units	Total PCs	% Users to PCs	Ratio
1	20	20	12.50	1:8
2	30	50	31.25	1:3
3	30	80	50.00	1:2

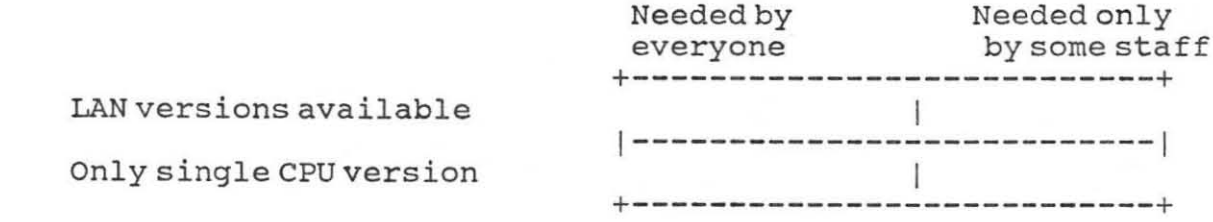
This purchasing sequence provides the following advantages to UHML.

- o Microcomputer technology changes extremely rapidly. This phased scheme allows UHML to consider newer technology as it emerges. For instance, it is expected that the new generation of microcomputers based on the Intel 80386 microprocessor will be available sometime in early 1987. The stability of the device, the stability of the marketplace demands, the availability of software, and the availability of alternate vendors should occur within a 12 month period after the new microcomputers are introduced. The 80386 based microcomputers should be evaluated carefully in phase 3.
- o The small initial number of microcomputers allows UHML support staff to become comfortable with the LAN and its management requirements.
- o The phased purchase sequence allows for more effective fiscal planning.

Expensive peripherals, such as laser printers and optical character readers, should be purchased "as needed and reasonable." A LAN based system allows microcomputer users to share these expensive but necessary devices in a reasonable manner.

Software purchases will be more complex and can be visualized in the following way:

Who requires access to the software?



Some software will be used by nearly all staff members. For instance, the word processor will be use by all staff members to varying degrees. Some software will only be used by some staff members. For example, the program to draw shelving floor plans will be used sporadically by the public service staff members. This

means that software that will be widely used, like word processors, need to be purchased in large quantities at lower unit prices while limited use software will be purchased in smaller quantities and higher prices.

Some software is available for purchase in network versions which are tailored for use in network environments and which reduces the cost per network node. Other software will not be available in network versions and will need to be purchased individually for each microcomputer user that requires access to that version.

"LIST PRICE & STREET PRICE". The prices quoted in the following sections are "list prices." These are the prices which the manufacturer of the goods suggest. In general, the actual price that these products are sold at is normally between 10 to 30 percent lower. In addition, educational institution prices are generally much lower than the list or street price. For example, the list price of dBASE III for a single workstation is $700. dBASE III Plus for LANs generally cost about $300 per workstation. The educational price is under $100 per node.

ESTIMATED COST. The estimated cost of each workstation is between $6000 and $7000. This estimate accounts for both hardware and software needs and distributes the cost of shared high cost items like laser printers and optical character readers. It assumes reduced cost per unit due to multi-unit purchase and educational discounts.

4. Recommended microcomputers and peripherals

4.1. Desktop microcomputer system

All the microcomputers described here are compatible with the IBM AT. The following configuration will be considered as required for each **workstation**:

- 6 or 8 (preferred) MHz 80286 microprocessor
- runs MS-DOS 3.1 or higher
- 20 megabyte (**Mbyte**) hard disk, at least 35 msec average access
- 1.2M byte/360K floppy disk drive
- 512K RAM, expandable to 2 megabytes
- at least 1 RS-232C serial port
- at least 1 Centronics parallel printer port
- EGA compatible display adaptor and CRT
- keyboard compatible with the IBM AT

The EGA compatible display card and CRT are <u>not</u> part of any of the basic configurations described below. Moreover, since there are several good EGA compatible cards available, these cards will be discussed separately.

It is recommended that **network servers** have the same configuration as the workstations described above with the addition of:

- 70 to 200M byte hard disk
- cartridge tape or Bernoulli Box backup device
- 2 megabytes RAM

The following microcomputers are listed in order of recommended preference.

4.1.1. Compaq Deskpro 286, $4500

This **8 MHz** system comes with a 30 or 70M byte hard disk and a 10M byte tape backup device. The line of IBM PC/XT/AT compatible (work-alike) microcomputers made by Compaq is considered the best of the AT level microcomputers. The performance, design quality, durability, and reliability of the Compaq units are excellent. The only shortcomings of the system are: (1) the keyboard is not well designed for touch typing and (2) the 10M byte tape backup device is inadequate to support the hard disk.

4.1.2. Tandy 3000 HD, $3600

The Tandy 3000 is an **8 MHz** microcomputer that is compatible with the IBM AT using either PC-DOS or Xenix applications. A 20M byte hard disk is supplied with the unit as part of the basic configuration. The price/performance ratio of this system is perhaps the best of any AT level system from a major vendor.

4.1.3. ITT Xtra XL, $5000

The **8 MHz** ITT Xtra XL was designed for use as a multiuser microcomputer system. It is possible to support up to 32 terminals using a single XL. The basic configuration includes a 40M byte hard disk. If budget considerations reduce the likelihood of purchasing microcomputers in sufficient quantities to support UHML, then this microcomputer should be considered. ITT provides an optional slave 80186 processor boards which can support many users at a fraction of the cost of purchasing multiple workstations. Please note that the XL is quite different from the older 80286 based ITT microcomputer known as the ITT XTRA XP.

4.1.4. Epson Equity III, $4000

A 20M byte hard disk is a part of the basic configuration. The **6 MHz** Equity III does not have an 80287 socket. Despite its relatively slow CPU speed and lack of an 80287 socket, it is an excellent microcomputer that should be considered.

4.1.5. Zenith Z-200, $4000

The wide acceptance of the Zenith line of PC/XT/AT compatible microcomputers is evident from the large scale purchases made by the Internal Revenue Service (IRS), which bought 15000 lap portable computers, and the large scale purchases made by the military. The **6 MHz** Z-200 Advanced PC has one of the best keyboard designs of all the IBM AT workalikes. There are no known shortcomings at this time. However, based on past Zenith offerings, there is some question as to how compatible the unit is at the hardware (add-on board) level.

4.1.6. Hewlett-Packard Vectra, $4000

The **8 MHz** HP Vectra is a good IBM AT work alike. Although the keyboard itself has a comfortable feel for touch typists, it is too wide for

easy access of the numeric keypad. The separate cursor key pad and numeric key pad is a distraction during heavy use. A problem to consider is that the HP Vectra system is delivered in component form. Items such as the hard disk must be installed by the user. The HP system hardware installation documentation is inaccurate in places and lacking in technical detail.

4.2. Portable microcomputer system for use on travel

Portable microcomputers are distinguished from transportable microcomputers, such as the Compaq, primarily by weight. The transportable microcomputers are between 25 to 30 pounds. The portable microcomputers are between 9 and 15 pounds. This weight difference is due to improved microelectronic design and manufacturing techniques and the use of flat display technology such as LCD displays instead of the larger and heavier Cathode Ray Tube (CRT) technology. Some of these units can be operated under battery power. However, it is recommended that these systems be considered "away from the office desk computers which are very easy to transport."

The following portable microcomputers are listed in order of recommended preference.

4.2.1. Toshiba T-1100, $2000

This 4.77 MHz 80C88 9 pound portable has a very readable LCD and a good keyboard. It was found to be very compatible with software written for the IBM PC. It can be operated using either battery or AC electrical power. The T-1100 has the following features:

- 512K RAM
- 1 720K internal 3.5" disk drive
- 1 Centronics parallel printer port
- RGB display interface
- Composite video port

Options are:
- 5.25" external floppy disk drive
- 3.5" external micro disk drive
- 300/1200 baud internal modem
- RS-232C serial port

[*NOTE] It was recently announced that an enhanced model of this computer will be released for sale soon. The enhanced model will be called the T-1100 Plus and will have a list price of $2500. The following standard features distinguishes the T-1100 Plus from the older model:

- 640K RAM
- 80C86 CPU
- 2 720K 3.5" internal disk drives
- serial port
- better display

4.2.2. Toshiba T-3100, $4500

The only reason this portable is not the first choice among portables is its high price. This 15 pound unit is a **8 MHz 80286** based AT compatible unlike the other portables which are 80C88 based PC compatibles. This is the most powerful portable microcomputer currently available. It does not have a battery pack. It can only be operated using AC electricity. Its features are:

- gas plasma display (very readable)
  640x400 resolution
- 10M byte hard disk
- 720K 3.5" disk drive
- 640K RAM
- RGB display interface
- Centronics parallel printer port
- RS-232C serial port

Options:
- external 15-key keypad
- internal 300/1200 baud modem
- memory expansion to 1M byte RAM
- link for using IBM PC floppy disk drives
- external 5.25" disk drive

4.2.3. Kaypro 2000, $2000

The Kaypro 2000 is a 14 pound 80C88 based portable microcomputer that is compatible with nearly all programs written for the IBM PC. The unit can be operated using either a battery or AC electrical power. It is functionally superior to the Toshiba T-1100 in several ways: more RAM, built-in serial port, easy expansion. However, the LCD display is not as readable as the T-1100. In addition, the Kaypro 2000 is over 50% heavier than the T-1100. The unit has the following features.

- 768K RAM (640K accessible to DOS, the rest the RAM can be used as part of a RAMdisk. Parts of the 640K accessible to DOS may also be allocated to a RAMdisk)
- 720K 3.5" disk drive
- 80x25 characters, 640x200 graphics LCD display
- RS-232C serial port
- detachable keyboard
- bundled with several applications programs

Options are:

- 300/1200 baud internal modem
- base unit with
  = 5.25" internal/external floppy disk drive
  = Centronics parallel printer port
  = 2 IBM PC compatible add on board slots

4.3. Portable computer for use in library stacks

It was determined that there is a need for UHML staff to (1) take notes in the stacks and to transfer that information to a desktop microcomputer and (2) collect barcode information from items in the stacks. A small lightweight microcomputer with a bar code reader would reduce the redundancy of manually transcribing notes to the desktop microcomputer.

4.3.1. Tandy Model 200, $800

This 80C85 based microcomputer weighs approximately 5 pounds. It has a 16 line by 40 column Liquid Crystal Display (LCD) which flips up from the main unit. The large character size and the display adjustment permits comfortable viewing under various lighting conditions. The standard unit comes with 24K RAM. Memory is expandable to 72K RAM. The low-power battery backed RAM is used for both as an active program workspace and as a long term file storage medium. Files stored to this RAMdisk system are stored as long as the batteries are charged. The system has a built in RS-232C serial port, a Centronics parallel port, a 300 baud direct connect modem, a port for a **bar code reader,** a battery backed time of day and date clock, and a set of ROM (Read Only Memory) based applications programs. The applications include (1) a full screen text editor, (2) the Microsoft Multiplan spreadsheet, (3) a telecommunications program, (4) an address data base program, (5) a personal schedule data base program, and (6) a version of the Microsoft BASIC programming language interpreter. Other applications programs, such as small data base managers, are available. Data stored on the Model 200 RAMdisk can be easily moved to (uploaded) the user's desktop microcomputer.

4.3.2. Radio Shack Model 100, $400

This 4 pound 80C85 based microcomputer is the predecessor to the Model 200. The basic unit has 8K of RAM. Memory is expandable to 32K. The LCD display is 8 rows by 40 columns (half that of the Model 200). This microcomputer has the same I/O ports that the Model 200 does. The Model 100 lacks the ROM based MultiPlan spreadsheet programs. However, it does have the other ROM based applications programs.

[***NOTE**] An announcement was made that the Model 100 will be discontinued in the near future. The model replacing it, the Tandy Model 102 ($500 list price), will have greater functionality at the same list price. The Model 102 will have 32K RAM in the base model and be smaller and lighter than the Model 100.

4.3.2.1. Model 100/200 Bar Code Wand, $100

The bar code reader is supplied with BASIC callable software that allows the Model 100/200 to read Universal Product Code, 3 of 9, Plessey, and other formats.

4.3.2.2. A/C Adaptor, $6.00

4.4. 80287 Numeric Coprocessing Unit (NPU), $250

The 80287 works with the 80286 Central processing unit to process mathematical operations, such as the calculation of transcendental functions, usually performed in software. The 80287 performs these calculations many times faster than the equivalent software functions. This allows many computational intensive applications such as spreadsheets to work much faster.[1] Workstations which will be used primarily for such work as spreadsheet analyses should be equipped with the 80287.

4.5. Expanded Memory Specification (EMS) cards

The Expanded Memory Specification (EMS) developed by Lotus and Intel specifies a technique for software to access more memory than the present PC/MS-DOS 640K byte maximum. Memory above the 640K limit is accessed using a technique called "paging." Paging accesses chunks of memory as needed. This techique is slower than accessing memory as one contiguous piece. This limitation is a historical artifact due to the design of the 8088 CPU used in the IBM PC. The 8088 is only able to access one megabyte of memory. PC/MS-DOS allowed only a 640K chunk of this to be used by programs (the rest was reserved for features like video display memory). The newer IBM AT and workalike computers use an 80286 CPU that has two memory access modes. The "real mode" allows the 80286 to access memory as an 8088 does. The 80286 is limited to accessing one megabyte of RAM when in this mode. The other memory access mode, and almost unused for the present, is called the "protected mode." It is in this protected mode that the full power of the 80286 CPU is realized and the potential of accessing 16M bytes of memory is realized. This kind of large memory access is called "extended memory" and is presently not supported by most applications programs. However, the release of MS-DOS 5.0 sometime in 1987 should change this support problem. It is therefore **recommended** that any memory expansion board purchased for the UHML microcomputers support both extended and expanded memory.

4.5.1. Eccell, $600 (0K RAM)

Orchid Technology
47790 Westinghouse Dr.
Freemont, CA 94539
(415) 490-8586

The Eccell board supports both extended and expanded memory specifications on 80286 based microcomputers using PC/MS-DOS. This permits it to be used both with current programs that support the Lotus-Intel-Microsoft EMS and future products which will use extended memory specifications. The board supports up to 1 megabyte of RAM. Another 2 megabytes (for a total of 3 megabytes on board) can be added using a $165 daughterboard.

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[1] Note that software must be specifically written to use the 80287 NPU to take advantage of its capabilities.

Memory on the Eccell board can be used to "backfill[2]" memory on the microcomputer. Error correction is performed using 3 parity bits instead of the more usual 1 parity bit. This allows for greater reliability in the event of RAM failure.

4.5.2. MegaPage-AT, $600 (0K RAM)

MicroWay
P.O. Box 79
Kingston, MA 02364
(617) 746-7341

This is the same board as the one sold by Orchid Technology. This vendor does not supply a setup program. Further, it does not provide documentation as good as the documentation provided by Orchid Technology for the Eccell.

4.5.2.1. 256K RAM chips, $40 for 9 chips

4.6. Video display systems

The display technology for the IBM PC and AT type microcomputers has evolved from monochrome text-only and low resolution (640x200) color graphics to the Enhanced Graphics Adaptor (EGA) standard which allows the display of medium resolution (640x350) monochrome or color text and graphics. This current display standard gives the user a single display system which has sufficient resolution to permit comfortable viewing when working with either text or graphics. More and more applications software are taking advantage of the greater display resolution and greater number of available display colors (16) available using the EGA. Some applications programs now function only with EGA level display technology.

4.6.1. Graphics adaptor card

4.6.1.1. SigmaEGA, $600

Sigma Designs
2023 O'Toole Ave.
San Jose, CA 95131
(408) 435-1480

This display adaptor board can operate in any of four display modes:
- o EGA
- o CGA (the older IBM Color Graphics Adaptor standard
- o MDA (the IBM Monochrome Display Adaptor); the text only display system

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[2] "Backfill" means to fill in whatever gap is present up to the current DOS memory limit of 640K. For instance, if the microcomputer has 512K of RAM on the motherboard, 128K of the RAM on the addon memory board will be used to fill out DOS accessible RAM to 640K.

o The Hercules monochrome graphics display standard

This display adaptor provides the greatest amount of flexibility of any available display adaptor in terms of providing access to both the older and newer display standards. The unit is supplied with 256K video RAM to allow full use of EGA features.

4.6.1.2. QuadRAM QuadEGA, $600 Not Recommended as per Todd 7/9/86

The QuadEGA is electronically identical to the Video-7 VEGA board. It has the same features that the SigmaEGA does. There are recent reports that the unit is exhibiting reliability problems.

4.6.2. CRT to be used with EGA boards

4.6.2.1. NEC JC-1401P3A Multisync monitor, $700

This monitor lacks the color purity of the IBM EGA Display. However, this monitor is functionally superior to the IBM EGA Display. The unit is not only usable with the EGA but also the IBM Professional Graphics Adaptor (PGA). The unit also has a swivel base which lets the user to adjust to display for comfort.

4.6.3. Projection system for group viewing & instruction

4.6.3.1. Sony Videoscope VPH 1020Q1 Color Video Projector, $5000

4.6.3.1.1. Exatron PC Interface, $150

This device is needed to properly interface the Sony projector to a PC RGB output.

4.7. Local Area Network (LAN)

A LAN allows microcomputer users in a small, well defined geographic area to communicate, share files, and share expensive resources such as large high capacity storage devices and high speed laser printers. The ability to share expensive microcomputer peripherals permits a fair distribution of resources to users and reduces the number of peripherals that needs to be purchased. However, the main cost saving benefit of a LAN is the human time saved by allowing fast and easy communication and sharing of information.

The LAN should be configured as a constellation of network clusters. A network cluster is a tightly defined group of microcomputers that work closely together to sharing resources. Each cluster, though interconnected to other clusters, is independent of other clusters. This means that even if an entire cluster fails, the other clusters will be unaffected.

Some LANs require that a microcomputer be dedicated for use as a network server. The network server controls the flow of information on the network and the sharing of files and peripherals. This server cannot be used by users

for other purposes such as word processing. Other LANs allow network file servers to be used as a workstation too.

The LANs described here all use baseband technology. Baseband LANs transmit at a high transmission rate on a single channel. Broadband technology allows multiple channels of information to be transmitted simultaneously. Broadband technology allows voice and video data to be transmitted alongside computer data. However, the best currently supported LANs for PCs use baseband technology. Moreover, the LANs described below are much more inexpensive to install and modify as network needs change. If current costs and other considerations make the choice of a LAN extraordinarily difficult, it is advisable to wait until early in 1987 before making a final decision.

4.7.1. IBM Token-Ring Network, $700 per workstation
$660 per Access Unit

The IBM Token-Ring Network transmits information at 4Mbits/second using inexpensive twisted pair cables to connect workstations. The maximum number of workstations on a network is 260. This network scheme does not require a dedicated server. Each workstation is connected to the network via the Multistation Access Unit (MAU). Each MAU can connect up to eight workstations or other network devices. The MAU also allows for an easy way to bypass a malfunctioning unit. If a unit is not functioning correctly, that unit can simply be unplugged from the MAU without disrupting the network. The maximum distance between any two MAUs connected by twisted pair wires is 200 meters.

4.7.1.1. Optical Fiber Repeater, $1650

The IBM Token-Ring Optical Fiber Repeater allows the maximum distance between any two MAUs to be extended to 2 kilometers.

4.7.1.2. Network Bridge Program, $1500

The Token-Ring Network Bridge Program allows multiple rings to act as one logical ring. Thus rings in Sinclair Library and Hamilton Library can appear to the user as one single ring. A dedicated AT with two adaptor cards is required to connect two rings.

4.7.1.3. Network PC Adapter II, $900

This upgraded version of the original Token-Ring Network Adaptor is recommended for use on file servers with 15 or more nodes to increase the efficiency of simultaneous file access requests and to reduce the response time for servers on large networks.

4.7.1.4. Network Manager, $1500

The Token-Ring Network Manager can monitor up to 260 network stations to troubleshoot, reconfigure, and control security. It requires a dedicated PC.

4.7.1.5. Network Modem Support

Several terminal emulation programs now support the use of a modem from any station on a LAN.

4.7.1.5.1. Smartcom II for the PC Network, $600

This program lets an unlimited number of stations on a LAN access a modem. One copy of the program must be purchased for every modem on use in the network. Each copy of the program is supplied with five (5) copies of the documentation.

4.7.1.5.2. PFS Access Version C.02, $140

The use of this program requires the additional purchase of the IBM Asynchronous Communications Server Software.

4.7.1.5.3. Crosstalk Network, $600

The program will support an unlimited number of terminals on a single network.

4.7.2. Racore LANpac Token-Ring Network, $400 per workstation

Racore Computer Products, Inc.
10 Victor Square, Suite 600
Scotts Valley, CA 95066
(408) 438-7255

The Racore LANpac uses the IBM PC Network Software and DOS 3.1. This LAN will support a maximum of 250 stations per cluster with a maximum distance of 1000 feet between stations. Repeaters can be used at 1000 foot intervals for up to 10000 feet between two nodes. CATV coaxial cables are used to connect the nodes. The data transfer rate of this LAN is 2 Mbits/second. A gateways is provided to link multiple LANpac clusters or the IBM PC Network and Token-Ring Network. This LAN does not require that a workstation be dedicated as a server. LAN-wide electronic mail is provided and is easy to learn and use.

4.8. High capacity hard disks

A Compaq Deskpro 286 with the Compaq 70M byte hard disk should provide sufficient capacity for functioning as a file server. However, if greater capacity is desired, larger hard disks are available. These large (i.e., more than 100M bytes) hard disks are very expensive, however.

4.8.1. Core International HC Series
115M, $5000
150M, $6000
260M, $9000

Core International
7171 Federal Highway
Boca Raton, FL 33431
(305) 997-6044

Core International has a reputation for making the most reliable and high quality large hard disks for the IBM microcomputer family. The HC Series of hard disk drives were designed for use as network servers. These drives are 5.25" full height drives that can be installed internally or externally. The average access times range from 15 to 20 milliseconds. This is in comparison to the 35 msec access time for the IBM AT 20M byte hard disk. The drives come bundled with the proprietary Core software called Gigafile that allows users to go beyond the 32M byte single volume limitation inherent in DOS.

*4.8.2. Bernoulli Box Plus, $6000
Iomega Corp.
(800) 521-6363

The Bernoulli Box Plus combines a 80M bytes hard disk with a 30 msec access time and a 20M byte removable disk pack disk drives with a 40 msec access time. Thus this unit can serve as both a large mass storage device (the fixed disk) and a backup system (the Bernoulli disk). There are no field evaluations of this unit. It should be critically evaluated before being seriously considered.

4.9. Disk backup devices

Two types of backup storage media are recommended: tape cartridges and Bernoulli boxes.

4.9.1. Tape cartridges

4.9.1.1. Genoa Galaxy External Tape Backup Subsystem 3200 Series (3260), $1400

Genoa System Corp.
73 E. Trimble Rd.
San Jose, CA 95131
(408) 945-9720

This 60M byte tape cartridge backup system backs up data at a rate of .33M bytes/minute. The accompanying software can be used either in a batch format (command line driven) or menu mode. Data can be accessed from tape in either a file-by-file basis, for specific file retrieval, or image format, for full disk recovery.

4.9.1.2. Sysgen QIC-File, $1500
Sysgen, Inc.
47853 Warm Springs Blvd.
Fremont, CA 94539
(415) 490-6770

This unit is also a 60M byte tape cartridge backup system. Its features are similar to the Genoa unit described above.

4.9.2. Iomega Bernoulli box, $3000 for single 20Mbyte drive

The 20Mbyte version of the Bernoulli box should be seriously considered for use as both a backup device and primary storage device. The Bernoulli box uses a removable medium made up of multiple 8 inch platters which has a 35 msec average access speed and a very high reliability rate. Bernoulli boxes should be considered for use as primary mass storage devices if sensitive data needs to be stored on a medium for frequent access.

4.10. Modems

A modem[3] allows computers to communicate with each other over voice grade phone lines. Modems are essential for allowing the UHML microcomputer system to communicate with large remote databases and electronic mail services (including Telex). Software that allows modem use on LANs is available. Thus, it is not necessary to provide modems at every network workstation.

The modems listed below all are able to communicate at 300, 1200, and 2400 baud. This multiple baud support means that you are able to communicate with all present services, which generally supports only 300/1200 baud transmission, and current and future services which support 2400 baud transmission. This allows communication with other sites and services at optimal levels. All the modems support the now standard Hayes modem control language.

4.10.1. Novation Professional 2400, $800

This modem is capable of delivering reliable data transfer under noisy conditions. It is slightly better than the Hayes 2400 and is much better than the Courier 2400. The unit fully supports the standard Hayes modem command set. In addition, it has the following features.

- Easy front panel control using button panel
- LCD alphanumeric status display
- Upgradable ROM
- Dial in password protection

4.10.2. Hayes 2400, $900

Hayes established the standard for PC modem control command set (the 'AT' attention commands) and product quality. It performs excellently and is replaced quickly by Hayes Microcomputer should the unit fail. As a result of being considered the standard modem, all PC modem software which supports 2400 baud transmission supports the Hayes 2400

4.10.3. U.S. Robotics Courier 2400, $700

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[3] The word "modem" is a contraction of modulation-demodulation.

The Courier 2400 modem is a good low cost 2400 baud modem. It performs well under normal conditions. However, its failings when used with noisy telephone lines require more testing before choosing it as the standard system wide modem. Its most notable problem is the tendency to lock up after encountering signal loss. This lock up requires power cycling (turning the unit off and on) to allow it to be used again.

4.11. Printers

No single printer meets all of the printed output (hard copy) needs of UHML staff. However, the printer types listed below, taken as a group, will meet all the printed output needs.

4.11.1. Laser Printers

Laser printers are capable of producing high quality printed and graphics output. Often, the printed output approaches typeset quality. This high quality output coupled with the high output speed (8 pages per minute for the models listed below), and the quiet operation of the units make laser printers ideal for OA tasks and the office environment. In addition to traditional word processing tasks, laser printers are also capable of performing such jobs as printing both blank and filled forms as well as black and white graphics.

4.11.1.1. HP LaserJet Plus, $3000

This model is the best supported laser printer available. Virtually all software that support laser printers supports the HP LaserJet Plus. The HP LaserJet Plus is based on the Canon laser printer engine which uses a xerographic process to produce high quality output on a variety of surfaces including bond paper, transparencies, and envelopes. The printer can produce a wide variety of fonts and type sizes if additional fonts are purchased. These additional fonts can be purchased in either firmware or software form. Graphics with dot resolutions up to 300 dots per inch can be achieved. Its input paper tray can hold 100 sheets of paper. The output paper bin can hold approximately 25 sheets of paper. Single sheet feeding of such items as envelopes is performed by using a special entry slot in the rear of the printer. A printer of this type should be placed at each network server. This will allow five (5) users to share this resource.

4.11.1.2. HP LaserJet 500 Plus, $3995

The HP LaserJet 500 Plus has all the features the HP LaserJet Plus has. The difference between the two models is that the 550 Plus has two input trays. Each tray can hold up to 250 sheets of paper. The output bin can hold 100 sheets of paper. This printer should be placed on servers where hard copy output demand is high.

4.11.1.2.1. Downloadable fonts

The HP LaserJet Plus can output different font types and sizes by either acquiring the additional fonts on a ROM (Read Only Memory) based cartridge or on a floppy diskette. These additional fonts can be used by any of the word processors recommended in this report.

4.11.1.2.1.1. VS Software, $250

VS Software Fonts
P.O. Box 6158
Little Rock, AR 72216
(501) 376-2083

4.11.1.2.1.2. HP Soft fonts, $200 - $300

4.11.2. Inkjet Printer

This kind of printer forms characters by spraying ink onto the surface the printer paper rather than striking it. An important characteristic of this type of printer is its quiet operation. The printer quality of low cost inkjet printers is generally near or slightly below dot-matrix printer output. This kind of printer is necessary in tasks which require a constantly viewable running history of a session. An example of this is the need for a hard copy history of an remote data base search session.

4.11.2.1. HP ThinkJet, $400

The HP ThinkJet is an inexpensive printer that is becoming the standard alternative to dot-matrix printers in those environments where printer quality is not an issue, occupied space is an issue, and quiet operation is a must. The printer has the following disadvantages. Its print quality is poorer than dot matrix printers of comparable price. It requires specially prepared paper that is more expensive than regular printer paper. The ink cartridges are relatively inexpensive and is perceived to be used up too quickly. The printer cannot perform half-carriage motions in both directions. This makes it impossible for it to create super- and sub-scripts. The Epson emulation mode is not complete and can lead to some printer control problems.

4.11.3. Dot matrix printers

4.11.3.1. Epson FX-85, $500

The FX-85 is the most recent model in a line of dot-matrix printers which is considered to be the standard dot matrix PC printer. All PC software requiring printer output supports the Epson series of printers. This unit is rated at 160 cps (though the true throughput is probably around 90 cps) and supports both IBM Graphics control codes as well as the Epson control codes. It has front panel push button control for such tasks as switching between draft and near letter quality (NLQ)

mode. The unit is somewhat noisy and may require a sound enclosure box.

4.12. Plotters

There are several UHML applications that require hard copy output that is best produced by a color plotting device. These tasks include floor plan design, the preparation of figures for presentations and publications, the preparation of quick and easy to read signs, the preparation of organization charts, and the preparation of flowcharts.

4.12.1. HP 7475A, $1500

The HP 74xx series of plotters are considered the plotters of choice to support by PC software manufacturers. As such nearly all PC software that supports plotter output supports HP plotters and this model, the 7475A, in particular. This plotter will plot on paper larger than the standard 8.5"x11" paper size. This permits the creating signs and posters of sufficient size to be visible by library patrons.

4.13. Voice management

Voice management refers to the use of the computer to deal with problems related to the use of the telephone. This includes answering machine like functions and phone book searches as well as data communications.

4.13.1. Watson, $700
Natural Microsystems Corp.
6 Mercer Rd.
Natick, MA 01760
(617) 655-0700

Watson functions as both a modem and as an intelligent answering machine. The metaphor used is that of the Rolodex card file. Five (5) files are maintained. These files are:

- phone book file
- outgoing message file
- incoming message file
- calendar file
- dictation file

Through these files Watson is able to answer the phone and respond to specific touch tone sequences produced by the caller by producing different outgoing messages for predetermined touch tone sequences. This would allow UHML to do provide different voice messages to callers based on different touch tone sequences; e.g., desk hours, library hours, upcoming holiday, etc.

There are two ways to store outgoing speech: high density and low density. One difference produced by this is the accuracy with which your voice is recorded. The other difference is the amount of disk storage required.

For instance, one minute of speech takes up 240K bytes in one format and 60K bytes in the other.

The modem part of Watson is Hayes compatible. A modified version of the PC-Talk III terminal emulator is provided with Watson.

4.14. Optical Character Reader (OCR)

An OCR is a device that scans text on a printed page and translates it into a form that can be interpreted by a computer. This permits information which is currently only available as printed material to be entered into the computer for integration into applications like word processors and data base managers. Note, however, that even the best OCRs are unable to read red or green text. In addition, it is not possible to guarantee 100% accuracy for any given font or that every possible font will be readable by the OCR. The better, and therefore more expensive, OCRs are able to use pattern matching techniques to "learn" about new fonts that are encountered. The inexpensive OCRs are only able to interpret a few fonts in a few point sizes rendering them useless in many situations.

4.14.1. Kurzweil 4000 Intelligent Scanning, ~$36,500

Kurzweil Computer Products, Inc.
185 Albey St.
Cambridge, MA 02139
(619) 864-4700

The Kurzweil 4000 high end unit of a series of OCRs manufactured by Kurzweil and is the best OCR available. It uses pattern matching techniques to "learn" fonts that are not familiar to it. It is capable of scanning multiple fonts on a single page. Its operation is reminiscent of a top feed photocopy machine. Sheets of paper are placed face down on a plate of glass and scanned from top to bottom. The accuracy of this unit is very high given any arbitrary font type and font. However, it should be noted that the Kurzweil 4000 not capable of detecting red or green print. Information can be transferred to a PC or AT type microcomputer via either floppy disk or serial ports.

This model has the following features:

- Terminal (keyboard and display)
- 384K RAM
- 10 megabyte hard disk
- 5.25" floppy diskette (readable by IBM PC/XT/AT)
- RS-232C serial port

4.14.2. JetReader Plus, $3,250

Datacopy Corp.
1215 Terra Bella Ave.
Mountain View, CA 94043
(415) 965-7900

The JetReader Plus is supplied with software to recognize standard office typestyles. In addition, it can learn to recognize new typestyles. This unit has the following features:

- sheet feed mechanism for 10 sheets of either standard or legal size sheets
- interface card for an IBM PC

4.15. Bar code readers

*4.15.1. American Microsystems

P.O. Box 830551
Richardson, TX 75080
(817) 834-9659

Reader: $550
Bar code printer software: $80

The capability and reliability of this product is unknown. This is the only bar code reader for the PC that was identified in the preparation of this report.

4.16. Pointing devices

Some applications benefit from or require the availability of an electronic pointing device called a "mouse." This device allows the user to control the position of the on screen cursor by manipulating the box-like mouse on a flat surface. This device is often useful and sometimes essential when using drawing and painting programs.

There are two types of mouse technology. The Microsoft Mouse and the Apple Macintosh Mouse both use mechanical mouse technology. This kind of mouse uses sensors to determine the roll of a ball on the bottom of the mouse device. This type of mouse is often sensitive to the kind of surface it is used on and is prone to mistracking the position of the mouse due to skipping over a non-optimal surface. There is also the problem of the rolling ball mechanism developing problems due to dirt on the rolling surface. The other kind of mouse is the optical mouse. This type of mouse shines a light on a special striped surface and tracking the observed reflection. This technology allows for reliable and accurate position tracking.

4.16.1. Mouse Systems Optical PC Mouse, $150

(Package with PC Paint Plus should be chosen)
This is the most widely supported optical mouse. It is connected to the PC workstation via a RS-232C serial port. Software is provided to allow it to work with software intended for use with the Microsoft Mouse. It is suggested that every workstation be provided with a mouse.

5. Recommended ancillary supplies

There are many computer related supplies that must be purchased to maintain a microcomputer system. Some of these supplies are one time purchases (e.g., power protection devices). Other supplies will need to be purchased frequently. Some items below will only be mentioned to remind you that the item needs to be acquired. Other will be discussed in depth with recommendations and list prices provided.

5.1. Electrical protection devices

Microcomputers and their associated peripherals are sensitive to fluctuations in electrical power. These problems range from total loss of power (blackout) to potentially damaging continuous low voltage conditions (brownout) to short extremely high voltage spikes (surges). There are four types of devices to deal with one or more of these problems.

An Uninterruptable Power Supply or UPS consists of transformers and a battery which constantly provides AC power from the battery. This battery is constantly charged by the AC current. When a blackout occurs, the flow of power continues. However, since the battery is not receiving an AC charge, it is unable to provide power for more than a specified amount of time (perhaps 10 to 20 minutes of uninterrupted power). Since power is always provided by the battery, the voltage level is always the same even during brownouts. The system also protects against electrical surges. This is the most expensive kind protection device.

A standby power supply serves much the same purpose as a UPS. However, instead of constantly providing power from its battery, it attempts to detect a loss of power and switch to battery power as soon as possible. However, since the battery is only brought into play when a total blackout occurs, the system powered by this kind of device is still affected by brownouts. Further, if a loss of power is not detected early enough, a "power glitch" could cause the unit powered by this device to power cycle. Not all standby power unit provide power conditioning (see description below). This device is less expensive than the UPS systems.

A power conditioner insures that the power reaching the computer is always stable. Good, large power conditioners are often as expensive as standby power supplies.

A surge protector only protects devices against transient high voltage spikes. Some devices also detect brownout conditions. The surge protector is the most inexpensive kind of power protection device.

Under ideal conditions each microcomputer and peripheral would be provided with a UPS. However, given a reasonable but limited budget, the following allocation of protection is recommended.

- Each file server should be provided with either UPS or Standby Power Supply protection. In the event of a blackout this would allow an operator to save active files and shut down the system in an orderly fashion.

Enough power should be available to power the entire microcomputer, hard disk drive, display, and a lamp to allow the operator to see what he or she is doing.

- Every sensitive device, such as a modem, should have a surge protector between it and its AC power supply.

5.1.1. Uninterruptable Power Supply (UPS)

5.1.1.1. Best Power Technology, $1600

This 500Va unit will provide power for 20 to 100 minutes depending on the electrical load. Auxiliary 12 volt batteries can be added to allow for a longer power backup period. In addition, it features a RS-232C serial port which can be connected to a microcomputer for reading and setting parameters.

5.1.2. Standby power supply

The local vendor for the following standby power products is:

Integrated Circuits Supply
1613 Houghtailing, Rm 1
Honolulu, HI
(808) 841-4175

5.1.2.1. Topaz, 400Va, small battery, $845

This standby unit will provide an IBM AT size LAN file server power for 9 to 25 minutes depending on the electrical load.

5.1.2.2. Topaz, 400Va, large battery, $935

This unit will provide an IBM AT size LAN file server power for 35 to 75 minutes.

5.1.3. Surge Protector

5.1.3.1. Data Shield S100, $100

PTI Industries
320 River St.
Santa Cruz, CA 95060
(408) 429-6881

This unit has six outlets. It also provides a low voltage sensor and an audio alarm to signal you when voltage drops below 102 volts. If a blackout occurs, the system shuts itself off and must be manually reset when power is restored. This helps prevent the possibility of damage due to a post-blackout voltage surge. The only disadvantage this model has is the lack of a central switch to control the six outlets simultaneously.

5.1.3.2. Data Shield S85, $90

This unit has the same number of outlets and affords the same protection that the Data Shield S100 does. The difference between the two models is that the S85 does not have an audio alarm and blackout reset switch. However, it does have a single switch to control the six outlets.

5.1.3.3. Max 6, $100

Panamax
150 Mitchell Blvd.
San Rafael, CA 94903
(415) 472-5547

This six (6) outlet protection device affords high quality protection similar to the Data Shield S100 and S85.

5.2. Cables, $20 and up

Various devices recommended here require connecting cables. This includes the LAN boards, modems, printers, plotters, and OCRs. It is essential that an adequate number of cables be purchased. It should be noted that the standard RS-232C serial port connector on IBM AT type machines is a DB-9 rather than the more common DB-25. Since many serial peripherals still use DB-25 connectors, this means that cables with female DB-9 connectors on one end and male DB-25 connectors on the other end must be purchased. Note that a parallel cable is recommended for use with the HP LaserJet Plus.

5.3. Acoustic covers for impact technology printers, $150 - $400

If impact printers are purchased for use in areas requiring a quiet environment, an acoustic cover should also be obtained.

5.4. Printer toners, ink cartridges, and ribbons

5.4.1. LaserJet toner cartridges, $90

The HP LaserJet Plus and LaserJet 500 Plus require toner cartridges that resemble the cartridges used by the Canon Photocopiers. It is important to note that the Canon and HP cartridges are not interchangeable. The only cartridges that will function with the HP LaserJet printers are the ones manufactured by Hewlett-Packard. An HP toner cartridge will print approximately 3000 pages of text before requiring replacement.

5.4.2. Dot matrix printer ribbons, $6

5.4.3. Inkjet printer ink cartridges, $7

5.5. Printer paper

5.5.1. HP LaserJet paper

The HP LaserJet does not require any special paper. It is able to print on a wide variety of surfaces. Paper intended for xerographic use works well with the HP LaserJet.

5.5.2. Letter sized paper

5.5.3. Special forms

Impact printers using pin paper feeds can make use of several special forms such as post cards, etc.

If certain forms cannot be generated on the HP LaserJet, the following suggestion should be considered. A transparency of the blank form should be made. The information for the form can be printed in the appropriate location on a blank sheet of paper. This information can then be overlayed by the transparency and photocopied together creating a sheet with a complete form.

5.6. Diskettes and tapes

5.7. Disk and tape storage boxes and binders

5.8. Disk and tape safe

5.9. Diskette marking pens

Sanford Label Pen, $1 each

Computer users will occasionally neglect to mark a diskette label before affixing it to the diskette. Frequently, a user will also desire to change or add information on the gummed label. Using a standard writing instruments such as pencils and ball point pens to perform this task could physically damage the diskette. A suitable soft tip pen is safer to use for this purpose. Moreover, all label writing should be performed using a pen with the following features.

- permanent ink that does not smear
- quick drying
- able to write on the glossy surface of a disk label
- correct size tip for easy writing

5.10. Microcomputer and peripheral covers, $10 - $30

Covers should be purchased for computers, printers, and other devices that may malfunction due to dust settling on various parts.

5.11. Anti-theft devices

A determined thief will steal away with the desired object no matter how much protection is provided. In addition, some of the more sophisticated electrical alarms can be more of a nuisance (false alarms during morning power on, etc.) than a help. Therefore, it is suggested that the anti-theft device used be considered more of a deterrent than an actual preventive device. There are, for instance, lock and cable accessories that use "super-glue" to adhere to the cabinets of microcomputers and walls. This eliminates the need for drilling cabinets, walls, and tables.

5.11.1. Kablit Systems, $60

Secure-It Inc.
10 Center Square
E. Londmeadow, MA 01028
(415) 525-7039

This anti-theft device does not require drilling for installation. Quantity discounts are available.

5.12. Anti glare devices

[** Will not fit all display types **]
Polaroid CP-50 Contrast Enhancement Filter, $45

Note that the filter mentioned above is only given as an example to compare filter performance against. This filter will not fit all display types. The filter used must be designed for use with whatever display monitor is selected.

Display screen glare is a common problem in office environments. This problem arises from non-optimal lighting, non-optimal chair and desk positions relative to window and artificial light, and other office environmental conditions which may not be easily controlled for. One way to deal with this problem is to place anti-glare filters on the microcomputer display.

5.13. Technical manuals

All associated technical manuals should be purchased. The presence of these documents will increase the ease of maintaining the various components of the system.

5.14. Tool kit and test equipment

A "doctor's bag" of tools (nutdrivers, tweezers, etc.), test equipment (RS-232 break out box, volt-ohm meter, etc.), and support devices (spare cables, etc.) should be available for the system support staff.

5.15. Computer furniture

Desks intended for writing are too high for use with computer keyboards. This can cause problems such as muscle fatigue and back problems due to improper

body positioning. This problem is compounded by the relationship of the seat to the desk, lighting, and accessibility of other work tools. Acquisition of furniture for use with the computer system should be strongly considered.

6. **Recommended application programs (software)**

Note 1: An asterisk (*) next to a section number indicates that this product has not been fully evaluated and should be approached with caution.
Note 2: A boldface capital letter C (C) indicates that the program disk is copy protected.
Note 3: A bold face capital letter P (**P**) indicates the program disk is copy protected but that an unprotected version is available for a nominal extra cost.
Note 4: A boldface capital letter (**E**) indicates that the software supports the Lotus-Intel-Microsoft (EMS) Expanded Memory Specification (EMS).

Copy Protection: The term "copy protection" refers to techniques which prevent the owner of a program disk to place working versions of the program(s) from the copy protected disk on other disks. It is preferable to purchase programs in unprotected versions for two reasons.

- o It is easier to recover from a catastrophic media disaster if unprotected programs are used.
- o Programs on protected disks are often difficult to backup properly using traditional techniques like magnetic tape. Heroic actions are sometimes required to properly backup these programs.

6.1. Window environment software

The current DOS environment has several limitations which prevents users from using the microcomputer to its fullest potential. Among there problems are difficulty in learning and using the disk housekeeping commands, difficulty in moving data from one application to another, and the inability to run more than one program simultaneously. Various windowing programs attempt to overcome some or all of these limitations. The term "windowing" reflects the appearance these programs create on the display. Multiple programs share the display by appearing in various segments of the screen. The user can "hop" from application to application by moving to the parts of the screen where the desired application resides. Some windowing software allows multiple programs to run simultaneously. These window programs also attempt to make the use of the computer easier by providing an easier way to perform such tasks as moving to a subdirectory, deleting files, copying files, and renaming files. It should be noted, however, that not all current software will run properly in a windowed environment. However, it is becoming apparent that many applications may run more efficiently in a windowed environment than the current DOS environment by late 1987.

6.1.1. Microsoft Windows, (E), $100

Microsoft Windows is a graphics based multitasking window environment (it will not work with a monochrome display) that functions in either a standalone workstation or LAN environment. It provides easy access to

DOS commands and the ability to easily move data from one application to another. This windowing program will be one of two or three major windowing environments within the next year. Several major software manufacturers, including Lotus, have committed themselves to produce software to operate in Microsoft Windows. However, not all current software will operate under Windows. There is speculation that Windows will be the environment of choice for near-future applications dealing in graphics and desk top publishing.

Microsoft Windows works best using both a keyboard and a mouse. However, it is still a usable working environment even with just a keyboard interface.

The following application programs are provided with the Microsoft Windows package: calculator, Rolodex-like card file, personal calendar, clock, terminal emulation program, small word processor, drawing program.

6.2. Word Processing

The word processor market is the most fragmented of the major applications program market. There is no single program that dominates the market at the moment. The best selling word processor (Word Perfect 4.1) only has approximately 8% of the total market share. This fragmented market reflects the wide variety of needs and personal tastes in this task. It also reflects the fact that there is no single word processor that is able to do everything expected by users.

The UHML staff presented a wide variety of word processing needs. In addition, there are the conflicting needs to address individual requirements as well as the necessity to maintain a uniform environment throughout the UHML system. This need for uniformity arises because:

- It is simpler to instruct the staff in the use of a single word processor rather than trying to provide training for three or four.
- UHML staff should be able to easily share and edit documents. Different word processors store text formatting information in different and incompatible ways. Therefore, if a document edit cycle requires that several people handle the text and staff members are using several different word processors, it will be difficult for these staff members to easily pass files around for editing.

The selection of a word processor for UHML wide use needs to be based upon factors which attempt to meet as may needs as possible. In general, the adequacy of a word processing program depends upon:

- o The user's preference in word processing user interface style. This usually depends on:
  - Previous experience with word processors
  - The kind of word processing tasks that are performed by the user
- o The amount of text that will be handled. For instance, a person who only deals with short letters and reports (less than 15 pages) will prefer an easy to learn and easy to use word processor. The response

time[4] of the word processor is not a critical issue here because of the small size of the text dealt with. In contrast, a user who frequently deals with large manuscripts will find that response time a very important aspect of the operation of the word processor.

- o The complexity of the required text formatting. The handling of multiple fonts, automatic indexing, automatic paragraph numbering are some of the features that some users will need.

The word processors recommended here are all WYSIWIG[5] oriented. They all provide excellent laser printer support and formatting control. While no single available word processor meets every requirement that UHML has, the programs recommended below all meet a majority of the identified needs. The word processors are listed below in rank order of recommendation.

6.2.1. WordPerfect 4.1, $500

WordPerfect is currently the best selling word processing program in the IBM PC marketplace. Its strengths are its flexible and sophisticated text formatting features coupled with an easy to learn and easy to use menu based design. Its only weakness is response time decreases in proportion to the amount of text is being worked with. For example, it took 5 seconds to go from the beginning to the end of a 50K byte heavily formatted file using a 8 MHz HP Vectra.

WordPerfect uses menus for some commands such as printer control and uses single keystrokes for such common functions as underlining. The use of menus for some functions makes WordPerfect easy to learn since the user is lead through certain complicated features as defining alternate typefonts. However, as the user becomes more comfortable with the program the multi-keystroke operations can be circumvented by defining keyboard macros[6].

A 110,000 word spelling checker and a thesaurus is included with the WordPerfect package. The spelling checker is able to check approximate spellings as well as phonetic spelling. For instance, it will recognize

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[4] Response time refers to the amount of time between the moment the user issues a command and the time that command is executed. It is always desirable to have the fastest response time possible.

[5] WYSIWYG is an acronym for "What You See Is What You Get." This means that such formatting features as underlining, boldfacing, and page breaks are seen on the screen as they will be in the printed output. This is in contrast to the older "dot command" oriented mainframe text formatters that did not allow the user to see what the output would look like until after the document was printed on paper.

[6] A keyboard macro allows a single keystroke to represent many. For instance, deleting a line in the "raw" mode of WordPerfect requires four keystrokes. This sequence of keystrokes can be reduced to one by assigning the keystrokes to a macro.

"Filidelfia" to be Philadelphia. Other features of this package are: automatic paragraph and outline numbering, automatic generation of table of contents and index, and mail merge capabilities. It is able to deal with two files simultaneously and can display and print multiple column text. In addition, a utility program that converts WordPerfect format files to and from WordStar, MultiMate, DCA, and DIF formats.

A version of WordPerfect intended for use with LANs is also available.

*6.2.1.1. WordPerfect Library, $125 (E)

This utility program provides an electronic clipboard to streamline the process of importing data from other applications programs to WordPerfect. Other facilities provided by this utility set are a calculator, a notebook, a calendar, and a macro editor. This RAM resident program occupies 28K of RAm and will take advantage of an Expanded Memory Specification board.

6.2.2. XyWrite III, $400

XyWrite III has the best response time of any word processor in the PC-DOS market. All commands issued by the user are acted upon immediately. There is almost no perceptible delay after the issuance of any command. It is superior to both of the other recommended word processors in both response time and formatting sophistication. It addition, it can display and work with up to nine files and windows simultaneously. The only reason it is ranked second is that it is not as easy to learn as WordPerfect and there may not be a suitable locally available instructor for this package. This package does not come with a speller or thesaurus. However, a high quality, low cost add-on spelling checker can be purchased for use with XyWrite III.

6.2.3. Microsoft Word Version 3, $450

Microsoft Word has the clumsiest user interface of the word processors recommended here. In fact, it is nearly unusable without a mouse attachment. Its response to user requests is sluggish at best. Further, the borders and bottom screen menu reduce the amount of text that can be viewed on the display.

There are, however, several reasons to consider this package. It provides excellent support for laser printers. It also provides support for Postscript which is emerging as the standard page description language. It is also one of the few major word processing packages that will run within a panel in Microsoft Windows. Since it appears that Microsoft Windows will emerge as a major PC support environment, such compatibility must be considered. Alternatively, if Microsoft Windows does emerge as a standard environment, then it seems likely that other major software manufacturers will support it also.

windows didn't make it

6.2.4. Foreign language word processing

*6.2.4.1. Exact, $475

Technical Support Software, Inc.
P.O. Box 289
Chestnut Hill, MA 02167
(617) 734-4130

Exact allows scientific and foreign fonts to be seen onscreen while using WordPerfect, XyWrite, or Microsoft Word. Educational discounts are available for this product.

6.2.5. Spell checker and thesaurus (only needed for XyWrite III)

6.2.5.1. WordProof, $40

IBM

WordProof can scan any ASCII file and check for typographical and spelling errors. A limited built-in editor allows on-the-spot error correction without the need to restart the word processing program. If XyWrite III is selected as the standard word processor, WordProof should be purchased to provide spelling checking.

6.3. Spreadsheets & enhancement programs

A spreadsheet program allows the manipulation of rows and columns of information. The most common kind of data dealt with are budget sheets with the results of various mathematical operations being placed in other rows and columns.

6.3.1. Lotus 1-2-3 Version 2, (**CE**), $500

Lotus Development Corp.
55 Cambridge Parkway
Cambridge, MA 02142
(617) 577-8500

Lotus 1-2-3 is the most widely used spreadsheet program for the IBM PC/XT/AT. In addition to spreadsheet functions, it provides limited graphics support (pie charts, bar charts, and line charts), and flat file database features. Lotus 1-2-3 has a large number of enhancement programs that provides features not provided by 1-2-3 alone.

6.3.2. VP Planner Version 1.1, (**P**), $100

Paperback Software International
2612 Eighth St.
Berkeley, CA 94710
(415) 644-2116

VP Planner is the best of several recently released programs that are nearly identical in function to Lotus 1-2-3 and are able to use Lotus 1-2-3 workfiles. VP Planner can also read and write dBASE III DBF files. The notable features of this program are its low price and its ability to work with multidimensional spreadsheets (1-2-3 worksheets are two dimensional). There are two drawbacks in choosing this program. First, there is no guarantee that future enhancement programs, such as the recently announced HAL natural language interface, will work with VP Planner. Second, the execution of functions is slower than 1-2-3.

6.3.3. Lotus 1-2-3 Report Writer, (C), $150

Report Writer augments Lotus 1-2-3 by providing report formatting features. This product should be obtained for UHML staff who need to incorporate Lotus 1-2-3 spreadsheet results in formal reports.

6.3.4. The Cambridge Spreadsheet Analyst, $90
The Macro Analysis Module, $50

The Cambridge Software Collaborative
University Place
Cambridge, MA 02138
(800) 446-1238

This product is a documentation and debugging tool for the Lotus 1-2-3 spreadsheet program. It aids the user in checking errors, analyzing logic, and preparing documentation. It should be provided to users who create extensive 1-2-3 macros and/or large spreadsheets with multiple dependent functions.

6.4. Database management

Several UHML tasks would benefit from the availability of a microcomputer based database program. Examples of some of these tasks are the maintenance of sabbatical and other staff related data, student help work status, vendor and institutional addresses and phone numbers, and collection building.

6.4.1. dBASE III Plus, (C), $700 (2 users)

Ashton-Tate
20101 Hamilton Ave.
Torrance, CA 95020
(213) 329-8000

dBASE III Plus is the latest version of what has become the relational database program to which all others are compared in the IBM PC microcomputer world. It can be argued that other PC based database programs have certain desirable features that are not present is this release of dBASE III Plus. However, choosing dBASE III Plus assures UHML of the availability of many third party support software, consultants able to provide adequate training, and the availability of programmers for custom applications.

dBASE III Plus has the following characteristics.

- 1 billion records/file
- 2 billion bytes/file
- maximum of 20 simultaneously open files
  = maximum of 10 open database files
- 254 bytes/field
- 5000 bytes/memo field
- able to read data from Lotus 1-2-3 WKS files

6.4.1.1. dBASE III Plus Lan Pack, (C), $1000 (3 users)

Ashton-Tate

The Lan Pack provides three copies of the dBASE III Access program. This allows three additional machines to use dBASE III Plus on a LAN.

6.4.1.2. dBASE III Ctools, $90

Ashton-Tate

This programming library allows programmers to access dBASE III Plus files from C programs.

6.4.1.3. Clipper, $700

Nantucket, Corp.
5995 South Sepulveda Blvd.
Culver City, CA
(800) 251-8438

Clipper compiles dBASE III code. This confers two benefits to you:

- dBASE applications run 2 to 20 times faster
- Since the compiled code can be run without a copy of dBASE III on the microcomputer system, this reduces the number of copies of dBASE that need to be purchased. Since most UHML staff will be end users rather than dBASE programmers, this method will allow UHML to distribute the applications netwide easily and at a reduced cost.

6.4.1.4. Lanlock, $100

Delta Contracting Services

Lanlock allows dBASE programs compiled by Clipper to be used on a LAN.

6.4.2. Q&A, $350

Symantec Corp.
10201 Torre Ave.
Cupertino, CA 95014
(408) 253-9600

Q&A features a flat file database with a natural language query front end. This means that the user can invoke a database query by typing the question in english. For example, the user could ask, "show me all the students who have worked more than 40 hours in the past month." The database can be modified or added to while in the natural language query mode. Date and time arithmetic can be performed to calculate events like "date due." Data can be displayed on the screen in either a "form" format or a tabular (spreadsheet like) format. Q&A does not have a programming language like dBASE III. However, the capability to make database inquiries in english reduces the need for many of the dBASE III programming language features.

The database has the following characteristics and limitations:

- maximum number of records = 16 million
- maxinum number of fields = 2400
- maximum field length = 1680
- maxinum number of screens per form = 10
- vocabulary for natural language query = unlimited

In addition to its database functions, Q&A also has a word processor which will handle a maximum of 80 pages and a 60000 word spelling checker. Information from the database can be integrated with reports prepared by the built-in word processor.

Q&A can easily deal with many of the small database jobs UHML staff require for day to day functioning. It can be made useful to the staff faster than dBASE III Plus could be. Although it is not as sophisticated or powerful as dBASE III or Reflex, its natural language query and modification features makes it a possibly very useful tool.

6.4.3. Reflex, (E), $150

Borland International
4585 Scotts Valley Drive
Scotts Valley, CA 95066
(408) 438-8400

Reflex is an easy to use limited database program that is able to present data in a spreadsheet format. The program is also able to present data graphically. A Reflex database is limited to 65534 records in a database file. Each record is limited to 128 fields with a maximum of 35512 characters per field. Reflex should be seriously considered as the standard database if UHML decides to support all "large" databases using the Pick

operating system. Reflex would allow individual staff members to maintain his or her own small databases using this product.

6.5. Terminal emulation

Please note that the programs described below are single station applications. The true network support terminal emulators are described in section 4.7.1.5.

6.5.1. PC/InterComm, $125

Mark of the Unicorn, Inc.
222 Third St.
Cambridge, MA 02142
(617) 576-2760

PC/InterComm provides excellent VT100 emulation. The VT100 features it does not support -- smooth scrolling, 132 column display, etc. -- is due to the limitations of the display technology rather than the software itself. File transfer can be performed either through simple screen capture, Kermit file transfer protocol, or XMODEM protocol. All features and settings can be selected through simple menus. A keyboard macro programming language is provided to enable the user to create login sequences and other common lengthy keyboard interactions.

6.5.2. Crosstalk XVI, $200

Crosstalk XVI is perhaps the most sophisticated terminal emulation program available for the PC. However, some users have found it to be difficult to learn to use and difficult to exploit its more advanced features.

6.6. Form design and generation

A form design and generation program provides the following capabilities:

- easy modification of current forms
- easy creation of new forms
- filling in form information online

6.6.1. Polaris Forms, $150

Polaris Software
310 Via Vera Cruz
Suite 205
San Marcos, CA 92069
(619) 471-0922

This software allows users to design and printout forms on a laser printer with text, graphics, and shading. Information can be merged from other programs (e.g., dBASE III) to automatically fill out forms.

6.7. Project management software

Project management techniques are useful in any effort which requires completion by some deadline with a limited amount of available resources. Project management software allows these techniques to be conceptualized and employed more easily than using traditional manual techniques. Project management software allows for the easy creation and printing of Gantt and Pert Charts. The most useful feature, however, is the ability to examine various resource allocation schemes to find the most nearly optimal distribution of resources given time constraints.

6.7.1. TimeLine 2.0

Breakthrough Software Corp.
505 San Marin Dr.
Novato, CA 94947
(415) 898-1919

TimeLine uses a Lotus 1-2-3 like interface to allow the user to create various charts and enter and manipulate resource information. The ability to exchange data with Lotus 1-2-3 is provided to the user after the user submits the product registration card.

6.8. Personal schedule management

*6.8.1. IntePlan 1.1, $200

Schuhardt Software Systems
515 Northgate Dr.
San Rafael, CA 94903
(415) 492-9330

This program maintains monthly and daily calendars, four notepads, and an account pad. There are four kinds of calendars including a moving "to do" list, appointments, notes, and a prioritized list of tasks.

6.9. Timesheets

A timesheet program allows the manipulation and verification of employee schedules.

*6.9.1. Timecard, $50

MDC
8230 Santa Monica Blvd.
W. Hollywood, CA 90046
(213) 656-7199

This was the only PC based timesheet program identified. It is untested and it capabilities are unknown.

6.10. Expert systems (ES)

An Expert System is a computer program that attempts to emulate the decision making processes of a human expert to solve problems that usually requires human expertise (e.g., diagnosing a medical problem). These programs can be used to aid human experts in reaching a decision, aid non-experts to reach a decision in the absence of a human expert, or attempt to teach novices problem solving skills. Expert Systems can be used within UHML to aid in procedural matters, representing area knowledge, and other applications that usually requires a human expert. Some Expert Systems allows the use of uncertain information (e.g., How sure are you that the bird you saw had one red wing?). It should be remembered that current expert system technology is limited to narrow areas of expertise. This is especially true of those Expert Systems used on microcomputers such as those in the IBM AT class.

6.10.1. EXSYS, $400

EXSYS Inc.
P.O. Box 75158
Contr. Sta. 14
Albuquerque, NM 87194
(505) 836-6676

EXSYS creates expert systems using production rules. Production rules are also called if-then rules. For example, the following are production rules:

IF computer does not power on
AND the plug is in the wall socket
THEN check wall socket for currrent

IF wall socket has current
THEN check computer power supply

6.10.1.1. EXSYS Runtime Package, (C), $600

This runtime package is required to distribute copes of expert systems developed using EXSYS. The license accompanying the package allows for the creation of an unlimited number of runtime copies.

6.10.2. KDS development system,$800
KDS runtime, $150
KDS II, $950

KDS Corp.
934 Hunter Rd.
Wilmette, IL 60091
(312) 251-2621

6.10.3. Expert Choice, $500

Decision Support Software, Inc.
1300 Vincent Place

McLean, VA 22101
(703) 442-7900

6.10.4. Personal Consultant, $950

Texas Instruments
P.O. Box 80963, H-809
Dallas, TX 75380-9063
(800) 527-3500

6.11. Bibliographic maintenance and preparation

PC based bibliographic programs are not recommended here to complement or supplant the current UHML online catalog system. The purpose of this kind of program is to provide library public service staff with an opportunity to become familiar with software that library patrons may request information and help with.

6.11.1. Personal Bibliographic System, $250

Personal Bibliographics Software, Inc.
P.O. Box 4250
Ann Arbor, MI 48106
(313) 996-1580

6.12. Statistical analysis

Most simple statistical calculations can be performed using either one of the recommended spreadsheet or database programs. However, should the required statistical analyses need more sophistication than is available in spreadsheets, the product below is recommended.

6.12.1. Statistical Analysis System (SAS/PC)
SAS PC/BASE, nominal yearly lease
SAS PC/STAT, nominal yearly lease

For more information contact:
Helen Carey, UHCC, x7351

SAS for the PC is derived from earlier versions which ran only on large mainframe and minicomputers. SAS/PC has been tailored for operation on the PC and is much easier to use than version on larger computers. The BASE and STAT programs are available on a per unit yearly lease basis.

6.13. Graphics

6.13.1. Floor plan design

6.13.1.1.	Autocad,	$300
	ADE 2,	$2000
	ADE 3,	$2500

Autodesk Inc.
2320 Marinship Way
Sausalito, CA 94965
(415) 332-2344

Autocad is a general purpose drafting and design program that is currently the best selling CAD program for the PC. It allows you to manipulate geometric entities on the screen (e.g., as representations of objects on a library floor). The ADE extensions add additional features such as the ability to curve fitting and to view three dimensional objects.

6.13.2. General purpose graphics

The graphics packages described below will:

- create graphics from scratch
- use data directly from spreadsheet and/or database files
- (some) will create word charts

6.13.2.1. Microsoft Chart, $300

Microsoft Corp.
16011 N.E. 36th Way,
Box 97017
Redmond, WA 98073
(206) 882-8080

Microsoft Chart is not able to directly manipulate a chart created by Lotus 1-2-3. However, it can read data directly from either Lotus 1-2-3 or dBASE. The maximum number of data points that can be handled is 128. It is able to create a dependency link directly with the data source file. This means that when data is updated in, say, a Lotus 1-2-3 worksheet, then the chart data is automatically updated.

6.13.2.2. Harvard Presentation Graphics, (P), $400

Software Publishing Corp.
P.O. Box 7210
1901 Landings Dr.
Mountain View, CA 94039
(415) 962-8910

Harvard Presentation Graphics will produce the following kinds of graphics output:

- word charts: title charts, free form text
- organization charts
- business charts: bar, line, pie

Data can be imported for use by Harvard Presentation Graphics from

either Lotus 1-2-3 files or plain ASCII text. This package does not provide the variety of chart types that Microsoft Chart does.

6.13.2.3. Energraphics, $600

Enertronics Research, Inc.
#5 Station Plaza
1910 Pine St.
St. Louis, MO 63103
(314) 421-2771

This program accepts data (numbers or text) from either the keyboard or an input device such as a mouse (for freeform drawing). The drawings can be rotated, enlarged, or shrunken and annotated with text in eight (8) fonts. Four charts can be presented on a single screen. Numerous output devices are supported. Three dimensional drawing features are also supported. The user interface is an easy to use menu.

6.13.2.4. EnerChart, $400

[Same address and phone number as Energraphics]

Enerchart is able to take data from Lotus files and create three dimensional pie, bar, and line graphics.

6.14. Organization and flow charts

Unless there is a need to produce extremely complex and sophisticated organization and flow charts, it is recommended that rather than purchasing special purpose software one of the general purpose graphics programs be use to produce such charts. If there is a need for such special software, the products listed below should be evaluated.

*6.14.1. Interactive EasyFlow, $150

HavenTree Software Limited
P.O. Box 1093-P
Thousand Islands Park, NY 13692

This program is able to produce both flowcharts and organization charts and output the charts on either printers or plotters.

*6.14.2. Org, $70

Banner Blue
5278 Reeder Court
P.O. Box 7865
Fremont, CA 94537
(415) 794-6850

Org is capable of producing diagram charts for organizations with up to 250 employees and 99 levels.

6.15. Utility programs

Utility programs generally provide functions that are very narrow and very necessary for day to day functioning and maintenance of a microcomputer system.

6.15.1. Norton Utilities 3.1, $125

Norton Utilities is an essential program to make available to UHML staff. One of the most important functions made available is the ability to recover accidentally erased files.

6.15.2. Smart Notes, $80

Personics Corp.
2352 Main St.
Concord, MA 01742
(800) 445-3311

Smart Notes is an electronic version of the 3M PostIt pads which are used to place convenient notes on various surfaces. Smart Notes allows the user to place electronic notes on text documents, spreadsheets, and other text based applications. These electronic notes are placed in a file separate file from the application file.

6.15.3. XTREE, $45

XTREE is a program that helps a microcomputer user navigate the various subdirectories on a hard disk. A graphic representation of the files and subdirectories on the hard disk is displayed to allow the user to see the organization of the hard disk and select a program for execution easily. This program aids the user in using the microcomputer effectively without requiring the knowledge of many DOS commands.

6.15.4. ZyIndex Plus for LANs, $700

ZyIndex searches for words or phrases in file scattered in various subdirectories on a hard disk. This allows the search for key words in notes, memos, letters, documentation, etc. without the need to build an elaborate database program.

6.15.5. ARC, $35/$50

System Enhancement Associates
21 New Street
Wayne NJ 07470

ARC aids in the archiving of files to floppy disks by using data compression to reduce the size of files and by combining files into a single ARC library file.

It should be noted that the program did not work correctly on the HP OfficeShare Network. It may not work with other PC networks.

This program is a "shareware" product. This means that it can be freely distributed at institutional sites if certain conditions are met. The following conditions have been stipulated by Systems Enhancement Associates.

You may copy and distribute this program freely, provided that:
1) No fee is charged for such copying and distribution.
2) It is distributed ONLY in its original, unmodified state.

If you like this program, and find it of use, then your contribution will be appreciated. You may not use this product in a commercial environment or a governmental organization without paying a license fee of $35. Site licenses and commercial distribution licenses are available. A program disk and printed documentation are available for $50.

7. Recommended computer services

7.1. Training

Proper and adequate training is essential if a microcomputer system is to be effectively used. Effective instruction reduces the learning curve length and therefore reduces the period reduced worker productivity that initially follows the introduction of microcomputers into the workplace. This reduction in production is inevitable because the worker must perform his or her normal duties as well as become comfortable with and learn about the newly installed microcomputer system. Learning how to use a complex system can become a frustrating task for even the most dedicated worker and reduces the expected effectiveness of the OA system. Proper instruction reduces the amount of frustration for the worker and helps ensure that the OA system will be used effectively and efficiently.

There are four kinds of training that will be required to allow UHML staff to effectively use a microcomputer system. These training categories are described below.

7.1.1. Classroom instruction for generic aspects of computer use at Kapiolani Community College (KCC).

Phone: (808) 735-8211

KCC has a program in place to design special instructional programs for companies and organizations. It is recommended that this service be considered for initial staff training in essential computer skills and techniques.

7.1.2. Inhouse training for unique requirements (e.g., information integration between word processor and spreadsheet)

7.1.3. Continuing training for upgrading of skills and training of new staff. This training can take several forms.

- advanced courses at KCC and elsewhere
- formal classes for UHML by UHML staff

7.1.4. Instructional software. Software is available to instruct users in the usage of several of the application programs recommended here. While instructional software is rarely as good as formal classroom instruction, it is useful to refresh skills or provide initial instruction to staff during periods when no formal classes are available. The chief advantages are (1) instruction availability at all times and (2) allowing the user to proceed at a comfortable pace.

The following firms provide instructional software:

Cdex-Intellisance Corp.
1885 Lundy Ave.
San Jose, CA 95131
(408) 263-0430

American Training International
12638 Beatrice St.
Los Angeles, CA 90066
(213) 823-1129

Individual Software Inc.
1163 Chess Dr.
Foster City, CA 94404
(415) 341-6116

McGraw-Hill training Systems
P.O. Box 641
Del Mar, CA 92014
(800) 421-0833

Advanced Systems Inc.
155 E. Algonquin Road
Arlington Heights, IL 60005
(312) 981-1500

7.2. Custom programming

It is unlikely that all office automation tasks will be solved "as-is" by off the shelf application programs. Two situations will arise: (1) It will be found that some tasks are not clearly solvable and (2) it will be found that some application programs will be judged as "too raw" in their out-of-box state by some UHML staff members. Therefore, custom programming will be required to (1) make the microcomputer system truly useful in OA tasks and (2) reduce the amount of time UHML staff require to become comfortable and proficient with the system.

7.2.1. Spreadsheet templates

Highly repetitive spreadsheet tasks, such as budget plans, are handled more efficiently if "spreadsheet templates" are written in a spreadsheet macro language.

7.2.2. Database management programs

Sophisticated database programs required by multiple users will require custom programming. Numerous dBASE III programmers are available locally. Fewer potential custom programmers are available for other database products.

7.2.3. Other

It may be necessary for special programs to be written to perform special tasks for unique UHML problems. One possible example is a program to smoothly take the bar code data from the Model 100 into a PC data base. Another example is a program to perform a quick context check on data obtained from an OCR and then transform it into a form that can be taken in by a data base program.

7.3. Maintenance

Maintenance contracts should be obtained for all major pieces of equipment. This contract will vary from product to product and vendor to vendor.

7.4. Telex

Telex service is now available without requiring the purchase of a dedicated Telex machine. A microcomputer and a modem provides the gateway to the Telex system. The system is based around the concept of an electronic mailbox. Telex messages sent to you are stored in your mailbox until the message is retrieved. Telex messages are sent out via your mailbox. ITT and Western Union offer Telex services. The third option listed is a new electronic mail service from AT&T that provides a two-way gateway to Telex. The AT&T option should be strongly considered.

7.4.1. ITT World Communications
Phone #: (808) 531-0561
Monthly fee: $20.00
Usage fee per minute: $0.38 to $2.25 based on distance to/from destination

7.4.2. Western Union
Phone #: (808) 536-4311
Monthly fee: $25.00
Usage fee per minute: ?

7.4.3. AT&T Mail

(800) 624-5123 electronic registration
(800) MAIL-672 voice registration

Note forwarded from Joe Bednar of AT&T on AT&T Mail fees

Monthly fee:	$2.00
Electronic Message	0.80
Electronic Note	0.40
Return Receipt Request	0.40
COD Electronic Message	1.25
Standard (US MAIL) Paper Message	2.00
Priority (Overnight) Paper Message	7.50
Urgent (Same Day) Paper Message	27.50
Additional Message Units	0.80
Domestic Telex Minutes	0.70
International Telex Minutes	Variable
On-Line Message Create/Edit	0.45
On-Line Note Create/Edit	0.20
Forms/Files User Fee	10.00
Shared Address Lists	2.00
Additional Storage Units	0.30
MAIL TALK Minutes	0.45
WATS Access Minutes	0.15
Service Fee (Monthly)	2.00
Signature or Logo Registration (Annual)	12.00
Directory Listing Fee (Annual)	12.00

There are also discounts up to 20% available depending on a company's usage.

PMX software for personal computers using the MS-DOS operating system costs $85, while software for computers with the UNIX system is priced from $550.

Some examples of how prices are determined by the creation and sending of messages include: Electronic notes of 400 characters or less, or about six lines, are 40 cents. Electronic messages between 401 and 7,500 characters, or about two- and-one-half typed pages, are 80 cents when created off-line (using a PC or UNIX system). Each note created on-line is an additional 20 cents and each message is an additional 45 cents.

For additional information, call AT&T Mail at 800-367-7225.
----END OF FORWARDED NOTE----

This electronic messaging service can send messages to and from Telex services although it itself is not a Telex service. The service can be used on any computer system running either the MS-DOS or UNIX operating systems.

7.5. Facsimile (FAX) transmission

*7.5.1. GammaFax, $1000

Gamma Link Synchronous Communications
2452 Embarcadero Way
Palo Alto, CA 94303
(415) 856-7421

Gamma Link is the only firm providing PC-to-fax communications. The GammaFax package consists of both the hardware and software necessary to transmit and receive fax transmissions. The hardware consists of a 9600 baud synchronous modem and a synchronous data link control adaptor on a single card. The software includes a menu driven program to emulate a fax machine and Dr Halo II PC (a graphics package) to edit graphics received from a fax. GammaFax translates files between the PC format and the format used by type III fax machines.

7.6. Connection to University of Hawaii computer system

Some UHML staff members may benefit from having accounts on other UH computer systems. These accounts would allow these staff members to have a line of communication to UH staff, faculty and students on these systems. In addition, there may soon be communication to sites outside of Hawaii that may prove valuable to UHML.

7.6.1. University of Hawaii Computer Center (UHCC)
7.6.2. Management Systems Office (MSO)

8. **In-house staffing**

The proposed system is of sufficient size to require staff solely assigned to maintain the system and provide assistance to UHML users. The following services should be provided to varying extents by inhouse staff. It is suggested that support staff be provided in phases paralleling the acquisition of equipment.

The following shows the staff that will be required at each phase.

Phase 1, Total FTE = 2.0, Total Staff = 3
1.0 FTE Network Administrator/Support coordinator
1.0 FTE student help programmer/consultant

Phase 2, Total FTE = 3.5, Total Staff = 5
1.0 FTE Network Administrator/Support coordinator
1.0 FTE Applications programmer/training coordinator
1.5 FTE student help programmer/consultant

Phase 3, Total FTE = 5.0, Total Staff = 7
1.0 FTE Network Administrator/Support coordinator
2.0 FTE Applications programmer/training coordinator
2.0 FTE student help programmer/consultant

8.1. System maintenance, support, and enhancement

A LAN microcomputer system requires personnel to provide network security, account control, file backup and recovery control, software usage control, system maintenance and troubleshooting, and site preparation as new microcomputers and peripherals are added. In addition, potential new software and hardware must be evaluated before being considered for network wide use.

8.2. Consulting

On-site, on-call consultants are essential to the smooth operation of the system. A user population of 160 performing regular computer work will generate between 15 to 20 requests for assistance per day.

8.3. Instruction

Although generic computer courses are useful and should be provided to UHML staff, there will still be a need for in-house instruction on various aspects of the system. This is especially true for custom applications which may be generated.

8.4. Physical and information security

Regular checks on physical and data integrity must be performed. Users are generally unconcerned with system security until some event directly affects their work. Personnel assigned to aid in maintaining security is required to prevent lapses on the users' part.

9. Summary

The recommendations in this report are just that: recommendations. The many and complex needs UHML has requires evaluation of the products listed in this document by UHML staff to decide what fits their needs best. In general, however, the following is a description of the recommended UHML microcomputer system.

Average price per workstation: $6000 to $7000

This price takes into account the cost of the workstation itself, software, and distributing the cost of share peripherals (e.g., laser printers and file servers).

The system:

A Local Area Network (LAN) based microcomputer system will allow UHML to maximize the effectiveness of a microcomputer system by providing an effective means of staff communication and sharing of expensive peripherals. A LAN is especially valuable for UHML given the separation of staff within and between buildings.

Workstation description:

Each workstation should be an IBM AT level microcomputer with a 20M hard disk, 640K of RAM, and a high resolution color display for text and graphics. Each file server, which can also be used as a workstation, should have at least a 70M hard disk.

Peripherals:

Printed output should be available in high quality as well as high speed. This means that laser printers should be easily accessible by staff. One laser printer should be available for every 5 to 10 staff members.

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